

REMARKS

The Official Action dated June 19, 2009 has been carefully considered. Accordingly, the present Amendment is believed sufficient to place the present application in condition for allowance. Reconsideration is respectfully requested.

By the present Amendment, claims 1 and 12 are amended to clarify that the recited oxygen permeability is that exhibited after thermal shrinkage treatment and to more specifically claim a level of $100 \text{ cm}^3/(\text{m}^2\cdot\text{day}\cdot\text{MPa})$ or less as measured at 30°C and a relative humidity of 80%, in accordance with the teachings in the specification, for example at page 21, lines 8-14. Claim 11 is amended to correspond with claim 1 from which it depends. It is believed that these changes do not involve any introduction of new matter, whereby entry is believed to be in order and is respectfully requested.

As a result of Applicants' previous Amendment filed March 9, 2009, claims 1, 5, 7-15 and 17-22 were pending, and these claims remain pending in view of the amendments set forth herein. As claims 21 and 22 are not rejected in the Official Action, an indication of allowance thereof is respectfully requested.

In the Official Action, claims 1-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over the Ohba PCT Publication WO 99/52973, the Examiner relying on the equivalent U.S. Patent No. 6,605,344 (U.S. '344) as an English translation of WO 99/52973, in view of the Bekele U.S. Patent No. 5,482,770. The Examiner asserted it would have been obvious to orient the film of Ohba in view of the teachings of Bekele. In response to Applicants' previous argument that the layer (a) in claims 1 and 12 is free of polyalcohol, the Examiner asserted that Ohba teaches that the polyalcohol is present in amounts of 1% or greater whereby it would have been obvious to eliminate the polyalcohol because the functions attributed thereto are not required in the barrier coating and/or a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close

enough that one skilled in the art would have expected them to have the same properties. The Examiner specifically asserted that a coating with 0% polyalcohol would have been expected to have the same properties as a coating having 1% polyalcohol. In response to Applicants' argument that the heat treatment necessary to render the polymer layer water resistant would cause the heat shrinkable film to shrink and render it unusable for applications requiring heat shrinkability, the Examiner asserted that the film may be oriented after application of the polymer layer. Finally, the Examiner asserted that the oxygen permeability of claim 1 is met by the Ohba examples.

However, Applicants submit that heat-shrinkable multi-layer films according to claims 1, 4, 5, 7-15 and 17-20 are nonobvious over and patentably distinguishable from the combination of Ohba and Bekele. Accordingly, this rejection is traversed and reconsideration is respectfully requested.

More particularly, the present invention is directed to a multi-layer film which is both heat shrinkable and exhibits excellent oxygen barrier properties after heat shrinkage. As defined by claim 1, the multi-layer film comprises a heat-shrinkable base film and, provided on at least one surface of the base film, at least one layer structure including a layer (a) formed of a poly(carboxylic acid) polymer (A) and free of polyalcohol, and a layer (b) formed of a polyvalent metal compound (B), the layers (a) and (b) being in contact with each other. The multi-layer film and the base film each exhibit a percent thermal shrinkage in at least one direction of 5 to 90% as measured by immersing the respective film in hot water at 90°C for 30 seconds and the multilayer film exhibits an oxygen permeability of 100 $\text{cm}^3/(\text{m}^2\cdot\text{day}\cdot\text{MPa})$ or less as measured at 30°C and a relative humidity of 80% after thermal shrinkage treatment. Claim 12 recites a similar multi-layer film wherein the layer containing the polyvalent metal compound (B) is formed of a resin. It is surprising and nonobvious that a gas barrier layer structure of a polymer layer (a), free of polyalcohol, and a layer containing

a polyvalent metal as claimed, formed on a heat shrinkable base film, exhibits heat shrinkability without impairing the gas barrier properties. In this regard, the Examiner's attention is directed to Table 1 at page 37 of the present application which shows the low oxygen permeability exhibited by the claimed multi-layer films, both before and after thermal shrinkage treatment.

The multi-layer films of the present invention are distinguishable from the combination of Ohba and Bekele in several important respects. First, the layer (a) in claim 1 of the present application is "free of polyalcohol", while, in contrast, the polymer layer disclosed in Ohba is "produced from a mixture of polyalcohol and at least one poly(meth)acrylic acid polymer" (Abstract). As noted above, the Examiner asserted in the Official Action that it would have been obvious to eliminate the polyalcohol because the functions attributed thereto are not required in the barrier coating and/or a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, i.e., a coating with 0% polyalcohol would have been expected to have the same properties as a coating having 1% polyalcohol. Applicants respectfully submit however that the Examiner's assertions are contrary to the explicit teachings of Ohba and the knowledge in the art and have no basis in the evidence of record or in precedential case law.

That is, Ohba repeatedly discloses that polyalcohol is a required component for producing the processed-polymer layer. See U.S. '344, for example, the Abstract (The present invention provides....a processed-polymer layer produced from a mixture of a polyalcohol and at least one poly(meth)acrylic acid polymer..."); column 1, lines 5-11 ("The present invention relates to....a polymer layer formed from a specific polymer, and more particularly....formed from a mixture of a poly(meth)acrylic acid polymer and a polyalcohol"); column 2, lines 1-5 (".... a polymer layer formed from a mixture of a

polyalcohol and at least one poly(meth)acrylic acid polymer...”), and column 3, lines 23-27 (“In the film of the present invention....a polymer layer formed from a mixture of a poly(meth)acrylic acid polymer and a polyalcohol”). Nowhere do Applicants find any teaching or suggestion by Ohba of a polymer layer which is free of polyalcohol, and, importantly, the Examiner has not indicated any such teaching in Ohba.

Rather, the Examiner relies on Ohba’s teaching that in consideration of production of a polymer layer exhibiting excellent oxygen-gas-barrier properties under high humidity, the mixture ratio by rate of poly(meth)acrylic acid polymer to polyalcohol is preferably 99:1-20:80, more preferably 95:5-40:60, much more preferably 95:5-50:50 (column 5, lines 50-55 of U.S. ‘344). However, nowhere does Ohba suggest that the polyalcohol may be omitted. Neither does Ohba provide any basis for one of ordinary skill in the art to conclude that sufficient oxygen-gas-barrier properties under high humidity conditions may be provided while omitting the polyalcohol. To the contrary, omitting polyalcohol is contrary to the explicit teachings of Ohba. It is well settled that it is error to find obviousness where references diverge from and teach away from the invention at hand, *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). As Ohba requires polyalcohol in the polymer layer, Ohba teaches away from the claimed invention in which the layer (a) is free of polyalcohol.

The Examiner asserted that ranges which do not overlap but are otherwise close can establish a prima facie case of obviousness, yet the Examiner failed to cite any authority which would allow one to completely eliminate a required component of the prior art to establish a prima facie case of obviousness. To the contrary, the case law on which the Examiner’s assertion is based, *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775 (Fed. Cir. 1985), related to a claim directed to an alloy comprising all of the elements of the prior art alloys.

While a prima facie case of obviousness may exist where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, see MPEP §2144.05, the Examiner has not provided any evidentiary basis for asserting that one skilled in would have expected a coating with 0% polyalcohol to have the same properties as a coating having 1% polyalcohol. Similarly, the Examiner has not provided any evidentiary basis for asserting that the functions attributed to the polyalcohol are not required in the barrier coating. In fact, the Examiner's assertions are contrary to the well-known knowledge in the art. In this regard, the Examiner's attention is directed to the Tanaka et al U.S. Patent No. 6,022,913 (Tanaka '913) cited in the Official Action. That is, Tanaka '913 discloses that heat treatment of a film of poly(meth)acrylic acid and polyalcoholic polymer results in a cross-linked structure which has ester bonds and which exhibits hot water resistance and gas barrier properties (see the Abstract, column 1, lines 14-23, and column 8, lines 12-16). Tanaka '913 discloses that the cross-linked structure results with as little as 1% of the polyalcoholic polymer (column 7, lines 14-18). Thus, Tanaka '913 establishes that one of ordinary skill in the art would appreciate that omitting the polyalcohol in the Ohba polymer layer would not provide a cross-linked structure and would not result in a film exhibiting the hot water resistance and gas barrier properties desired by Ohba. Therefore, contrary to the Examiner's assertion, Tanaka '913 shows that one skilled in the art would not have expected a layer free of polyalcohol to have the same properties as the Ohba layer containing 1% polyalcohol.

Further, according to Ohba, the polymer layer is subjected to a heat treatment, for example by passing the layer through an oven which is heated at a predetermined temperature for a predetermined time, or by bringing the layer into contact with a heat roll, and, after completion of the heat treatment, the resultant polymer layer has water resistance, i.e., the resultant polymer layer is insoluble in water or boiling water, and exhibits excellent gas-

barrier properties under high humidity (U.S. '344, column 9, lines 47-56). Ohba specifically indicates that a polymer layer is preferably subjected to heat treatment under conditions satisfying the relations between heat treatment temperature (T, Kelvin) and heat treatment time (t, minutes) as specified by the following formulas (a) and (b):

$$(a) \log t \geq -0.0253 \times T + 11.2, \text{ and } (b) 373 \leq T \leq 573 \text{ (} 100^{\circ}\text{C to } 300^{\circ}\text{C)}$$

(U.S. '344, column 9, lines 24-34). If the heat treatment is conducted at 100°C , T is 373 K, $\log t$ is 1.763 or more, and t is 58.0 minutes or more. Ohba specifically discloses Examples where the heat treatment was conducted at a temperature as high as 160°C for 120 minutes, 160°C for 30 minutes, 180°C for 15 minutes or 230°C for 30 seconds.

These heat treatments are significantly more rigorous than the thermal shrinkage treatment recited in claims 1 and 12 to obtain 5 to 90% thermal shrinkage of the presently claimed multi-layer films, i.e., immersion in hot water at 90°C for 30 seconds. Accordingly, one of ordinary skill in the art will appreciate that to heat shrink the gas-barrier film of Ohba, energy greater than that of the heat treatment in Ohba would be required and it would be impossible to heat-shrink the film using less energy than employed in the described heat treatment. In view of the rigorous heat treatment conditions required by Ohba, it is apparent that the conditions for obtaining thermal shrinkage in present claims 1 and 12, i.e., immersion in hot water at 90°C for 30 seconds, cannot result in a thermal shrinkage of 5 to 90% as required by claims 1 and 12 in the films of Ohba and that the energy employed in to obtain thermal shrinkage of the present multi-layer films is far smaller than the energy of the heat treatment in Ohba. Thus, the gas-barrier film resulting from the heat treatment in Ohba is a film that is not heat-shrinkable by immersion in hot water at 90°C for 30 seconds.

Accordingly, not only does Ohba fail to teach, suggest or recognize that the polyalcohol may be omitted, Ohba further fails to teach, suggest or recognize that by omitting the polyalcohol, the heat treatment taught by Ohba is not required in order to provide a multi-

layer film excellent in water resistance and oxygen-gas-barrier properties, as is provided according to the present invention.

The Examiner asserted in the Official Action that if the heat treatment necessary to render the Ohba polymer layer water resistant would cause the heat shrinkable film to shrink and render it unusable for applications requiring heat shrinkability, the film may be oriented after application of the polymer layer. However, the Examiner's assertion is made in hindsight of the present application as there is no apparent reason of record for one of ordinary skill in the art to make such a modification to the teachings of Ohba. To the contrary, Ohba discloses, for example, oriented polyethylene terephthalate (O-PET) or oriented nylon (O-Ny) for use as a base material. As well-known in the art, these oriented films are heat-set at a high temperature under tension after an orientation treatment in the production process. The heat set, oriented films are reduced in heat shrinkability and are substantially not shrunk even when immersed for 30 seconds in hot water at 90°C. If Ohba were to employ a heat shrinkable film as a substrate, in place of the disclosed base material, the heat treatment necessary to render the polymer layer water resistant would cause the heat shrinkable layer to shrink, therefore rendering the Ohba film unsuitable for applications requiring a heat shrinkable property.

Finally, the heat-shrinkable multi-layer film recited in claim 1 of the present application has an oxygen permeability of $100 \text{ cm}^3/(\text{m}^2 \cdot \text{day} \cdot \text{MPa})$ or less as measured at 30°C and a relative humidity of 80%, after thermal shrinkage treatment. Thus, the claimed films exhibit this excellent oxygen gas barrier property without polyalcohol, without subjecting the film to a heat treatment at a high temperature, and after heat shrinkage. Ohba provides no teaching or suggestion of heat shrinkability and therefore provides no teaching or suggestion that the oxygen permeability of a multi-layer film as presently claimed is surprisingly maintained after a thermal shrinkage treatment. Moreover, as Ohba does not show films after

thermal shrinkage treatment, Ohba does not show films meeting the oxygen permeability requirements of claims 1 and 12.

Thus, as described above, the heat-shrinkable multi-layer films of claims 1 and 12 exhibit excellent oxygen gas barrier properties, even after thermal shrinkage treatment, without employing a polyalcohol and without conducting a heat treatment as disclosed in Ohba. Ohba provides no teaching or suggestion of a such a multi-layer film, and the deficiencies of Ohba are not resolved by Bekele. That is, while Bekele teaches is it desirable for barrier packaging films to be heat shrinkable, Bekele does not disclose or suggest coating a heat-shrinkable base film with a barrier layer and does provide any other apparent reasoning for modifying the teachings of Ohba to result in the presently claimed multi-layer films.

More particularly, Bekele discloses a multilayer film comprising a barrier layer and an orientation-compatible polymeric layer wherein the barrier layer has a thickness of from about 0.01 to 0.75 mils and comprises EVOH (ethylene vinyl alcohol) having an ethylene content of from about 34 to 60 weight percent (column 2, lines 45-50 and 62-67). Additionally, with respect to the EVOH, Bekele discloses:

“Those of skill in the art of EVOH know that these polymers can be made from the copolymerization of a relatively wide range of weight percent ethylene monomer and vinyl alcohol monomer. EVOH polymers are thus often characterized by the percentage of ethylene units in the resulting copolymer, i.e., also referred to as the ‘ethylene fraction’, which, of course, is a mole fraction. In the multilayer film of the present invention, the ethylene fraction can, in general, be from about 34 to 60 weight percent, preferably, from about 38 to 48 weight percent ethylene, and most preferably, about 44 weight percent ethylene. EVOH polymers are currently commercially available with ethylene fractions of from about 27% to 48%. In general, the higher the ethylene content of the EVOH, the easier the orientation but the lower the oxygen barrier properties of the layer. The higher the vinyl alcohol content of the EVOH, the higher the modulus, the more difficult the orientation, and the greater the oxygen barrier properties of the layer.” (column 9, lines 44-61)

Accordingly, Bekele does not teach or suggest a layer formed of a poly(carboxylic acid) polymer (A) and free of polyalcohol as required by present claims 1 and 12. Moreover, Bekele does not teach or suggest that a layer structure formed of a poly(carboxylic acid)

polymer and free of polyalcohol, and a polyvalent metal compound as claimed provides a gas-barrier multi-layer film which is heat shrinkable without impairing the gas-barrier properties.

In determining patentability under 35 U.S.C. §103, it is necessary to determine whether there was an apparent reason to combine the known elements of the prior art in the fashion of the claims at issue, *KSR International Co. v. Teleflex, Inc.*, 127 S.Ct. 1727, 1740-41 (2007). Here, there is no apparent reason for combining the teachings of Ohba and Bekele in a manner which results in the claimed multi-layer films having heat shrinkability and excellent oxygen barrier properties. Accordingly, the combination of Ohba and Bekele does not render the claimed multi-layer films obvious. The rejection under 35 U.S.C. §103 based on Ohba and Bekele is therefore overcome. Reconsideration is respectfully requested.

Claims 1-20 were also rejected under 35 U.S.C. §103 as being obvious and unpatentable over the Tanaka et al WO 03/091317 (Tanaka '317), the Examiner relying on the equivalent U.S. Patent No. 7,476,712 (U.S. '712) as an English translation of Tanaka '317, in view of Bekele. The Examiner asserted that Tanaka '317 teaches a gas barrier film produced by applying a metallic compound to the surface of a poly(meth) acrylic polymer layer, a polymer layer may be applied to the metallic compound layer, and a heat sealable layer may be applied to the outer polymer layer. The Examiner asserted that Tanaka '317 teaches the film may be shrinkable, referring to column 29, beginning at line 27, but admitted that Tanaka '317 does not teach the film should be heat shrinkable. The Examiner again relied on Bekele as teaching desirability of heat shrinkability and the Examiner asserted it would have been obvious to therefore orient the Tanaka '317 film to make it heat shrinkable.

However, Tanaka '317 is not proper prior art to the present application. Moreover, Applicants submit that heat-shrinkable multi-layer films according to claims 1, 4, 5, 7-15 and 17-20 are nonobvious over and patentable distinguishable from the combination of Tanaka

'317 and Bekele. Accordingly, this rejection is traversed and reconsideration is respectfully requested.

More particularly, the present application is a §371 of PCT/JP2004/005995 filed April 26, 2004 and claims priority under 35 U.S.C. §119 to Japanese Application No. 2003-123004 filed April 25, 2003. Submitted herewith is a certified English language translation of Japanese Application No. 2003-123004. As is apparent from the translation, Japanese Application No. 2003-123004 fully discloses the presently claimed multi-layer films. See, for example, claim 1 and paragraphs [0015] and [0020] ("a percent thermal shrinkage in at least one direction of 5 to 90% as measured by immersing the base film in hot water at 90°C for 30 seconds", "provided on at least one surface of the base film, at least one layer structure including a layer (a) formed of a poly(carboxylic acid) polymer (A) and free of polyalcohol, and a layer (b) formed of a polyvalent metal compound (B), the layers (a) and (b) being in contact with each other", and "wherein the multi-layer film exhibits a percent thermal shrinkage in at least one direction of 5 to 90% as measured by immersing the multi-layer film in hot water at 90°C for 30 seconds"), and paragraph [0025] ("an oxygen permeability of 100 cm³/(m²·day·MPa) or less as measured at 30°C and a relative humidity of 80% after thermal shrinkage treatment").

On the other hand, the publication date of Tanaka '317 (WO 03/091317) is November 6, 2003, and therefore subsequent to the present priority application filing date of April 25, 2003. This reference is effective as of its publication date, not its international filing date, since it was published in the Japanese language. See 35 U.S.C. §102(e) and MPEP §706.02(f)(1) (If the international application was filed on or after November 29, 2000, but did not designate the United States or was not published in English under PCT Article 21(2), do not treat the international filing date as a U.S. filing date for prior art purposes. In this situation, do not apply the reference as of its international filing date, its date of completion

of the 35 U.S.C. 371(c)(1), (2) and (4) requirements, or any earlier filing date to which such an international application claims benefit or priority). Accordingly, the rejection based on Tanaka '317 must be withdrawn as Tanaka '317 is not proper prior art with respect to the present application.

Moreover, the multi-layer films of claims 1 and 12, discussed in detail above, are nonobvious over and patentably distinguishable from Tanaka '317 and Bekele. Tanaka '317 discloses a film which comprises a poly(carboxylic acid) polymer and a polyvalent metal compound, for example in a layer structure as described at column 5, lines 53-57 of U.S. '712. While Tanaka '317 discloses that a plastic substrate may also be employed (see column 11, beginning at line 1 of U.S. '712), Tanaka '317 discloses that an arbitrary plastic film having a known oxygen permeability is employed as a substrate. Applicants find no teaching or suggestion by Tanaka '317 of a substrate as required by claims 1 and 12, namely a heat-shrinkable base film.

Tanaka '317 also discloses that when the material of the film or laminate is appropriately chosen, such a packaging material can be endowed with, for example, easy-to-open property, easy-to-tear property, shrinkability, applicability to microwave ovens, UV-shielding property, or good appearance, specific examples of the form of a packaging container formed of the film or laminate include a bottle, a tray, a cup, a tube, a cap material for such a packaging container, and opening-sealing material for such a packaging container, and, similar to the case of the packaging material, when the material of the film or laminate is appropriately chosen, such a packaging container can be endowed with, for example, easy-to-open property, easy-to-tear property, shrinkability, applicability to microwave ovens, UV-shielding property, or good appearance (column 29, lines 14-28). However, the noted description of shrinkability is considered to refer to the property of the film to shrink around its contents in, for example, a vacuum packaging method under a vacuum, i.e., the film is

sufficiently flexible to closely surround the contents when vacuum evacuated. In any event, Tanaka '317 does not teach or suggest heat shrinkability and, as recognized by the Examiner, "does not teach the film should be heat shrinkable." Importantly, Tanaka '317 does not teach, suggest or recognize that a layer structure formed of a poly(carboxylic acid) polymer and a polyvalent metal compound may be combined with a heat shrinkable base film to form a gas-barrier multi-layer film having heat shrinkability without impairing the gas-barrier properties.

Bekele does not resolve the deficiencies of Tanaka '317. That is, as noted above, Bekele does not teach or suggest a layer formed of a poly(carboxylic acid) polymer (A) and free of polyalcohol as required by present claims 1 and 12. Moreover, Bekele does not teach or suggest that a layer structure formed of a poly(carboxylic acid) polymer and free of polyalcohol, and a polyvalent metal compound as claimed provides a gas-barrier multi-layer film which is heat shrinkable without impairing the gas-barrier properties. Thus, the combination of Tanaka '317 and Bekele does not provide any apparent reasoning to modify their teachings to arrive at a heat shrinkable multi-layer film as defined by the present claims, exhibiting heat shrinkability without impairing the gas barrier properties. Accordingly, the combination of Tanaka '317 and Bekele does not render the claimed multi-layer films obvious. The rejection under 35 U.S.C. §103 based on Ohba and Bekele is therefore overcome. Reconsideration is respectfully requested.

It is believed that the above represents a complete response to the Official Action, and places the present application in condition for allowance. Reconsideration and an early allowance are requested.

Please charge any fees required in connection with the present communication, or credit any overpayment, to Deposit Account No. 503915.

Respectfully submitted,

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